

CLAIMS

What is claimed is:

1 1. An address protocol for forwarding a message packet from a source node
2 to a destination node along a sequence of communicatively coupled nodes functioning as
3 a linear chain network, the address protocol comprising:

4 a relative destination address field including a counter programmed with an
5 initial value at the source node corresponding to a destination node that is a preselected
6 number of nodes away from the source node along the linear chain network;

7 wherein the counter is adjusted by a preselected step in value at each node the
8 message packet is forwarded to along the chain network until the counter reaches a
9 trigger value indicating that the destination node has been reached.

1 2. The protocol of Claim 1, further comprising an identifier field containing
2 an identifier to identify the message packet as having a relative address protocol.

1 3. The protocol of Claim 2, further comprising a relative source destination
2 field containing the initial value.

1 4. The protocol of Claim 1, further comprising a relative source destination
2 field containing the initial value.

1 5. An address protocol for forwarding a message packet from a source node
2 to a destination node along a sequence of communicatively coupled nodes functioning as
3 a linear chain network, the address protocol comprising:

4 an identifier field containing an identifier to identify the message packet as
5 having a relative address protocol; and

6 a relative destination address field including a counter programmed with an
7 initial value at the source node corresponding to a destination node that is a preselected

8 number of nodes away from the source node along the linear chain network;

9 wherein the counter is adjusted by a preselected step in value at each node the
10 message packet is forwarded to along the linear chain network until the counter reaches
11 a trigger value indicating that the destination node has been reached.

1 6. The protocol of Claim 5, further comprising a relative source address
2 field for storing the initial value.

1 7. The protocol of Claim 5, wherein the initial value is an integer having an
2 absolute value equal to the desired number of node hops and the counter is changed by a
3 step in value of one at each node.

1 8. The protocol of Claim 7, wherein the counter is programmed with the
2 initial value and the counter is counted down by one at each node hop until a trigger
3 value of zero is reached.

1 9. The protocol of Claim 7, wherein the counter has an initial value of zero
2 and the counter is counted up by one at each node hop until a trigger value equal to the
3 initial value is reached.

1 10. The protocol of Claim 5, wherein the initial value is a linear function of
2 the desired number of node hops.

1 11. The protocol of Claim 5, wherein at least one node in the linear chain is a
2 regenerator element.

1 12. The protocol of Claim 5, wherein the chain network is a virtual chain
2 network.

1 13. The protocol of Claim 5, wherein the chain network comprises a portion
2 of a ring network.

1 14. A method of sending a message packet along a portion of a network
2 function as a linear chain network from a source node to a destination node using an
3 address protocol having an identifier to identify the message packet as having a relative
4 address protocol, a relative source address field for storing an initial value, and a relative
5 destination address field containing a counter, the method comprising the steps of:

6 selecting an initial value that is a function of a desired number of node hops
7 along the linear chain network from the source node;

8 programming the counter to have the initial value;
9 adjusting the counter by a preselected step in value at each node that the message
10 packet is forwarded to; and
11 accepting the message packet at a destination node when the counter value
12 reaches a preselected trigger value;
13 wherein the preselected step in value is chosen so that the counter reaches the
14 trigger value when the packet has completed the desired number of node hops.

1 15. The method of Claim 14, wherein the message packet comprises a status
2 query message and further comprising the steps of:
3 requesting the destination node to send a status message packet having a second
4 identification field and a second counter in a direction along the chain back to the
5 source node;
6 programming the second counter to have the initial value;
7 adjusting the second counter by the preselected step in value at each node that
8 the message packet is forwarded to; and
9 accepting the status message packet when the counter reaches the preselected
10 trigger value;
11 whereby the status message packet is returned to the source node.

1 16. The method of Claim 15, wherein at least one of the nodes of the chain
2 includes a regenerator element.

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1 17. The method of Claim 15, further comprising the steps of: selecting a
2 return message; programming a second counter disposed in an address protocol of the
3 return message to have a return value having equal in magnitude of the initial value;
4 transmitting the second message in the return direction; adjusting the second counter by
5 the magnitude of the preselected value at each node that the message packet is
6 forwarded to; and accepting the return message packet at the source node when the
7 second counter reaches the preselected trigger value.

1 18. A method of sending a message packet along a chain network having
2 regenerator nodes from a source node to a destination node using an address protocol
3 having an identifier to identify the message packet as having a relative address protocol,
4 a relative source address for storing an initial value, and a relative destination address
5 field containing a counter, the method comprising the steps of:
6 selecting an initial value that is a function of a desired number of node hops
7 along the linear chain from the source node;
8 programming the counter to have the initial value;
9 adjusting the initial value of the counter by a preselected step in value at each
10 node that the message packet is forwarded to; and
11 accepting the message packet at a destination node when the counter value
12 reaches a preselected trigger value;
13 wherein the preselected step in value is chosen so that the initial value reaches
14 the trigger value when the packet has completed the desired number of node hops.

1 19. The method of Claim 18, wherein the message packet comprises a status
2 query message and further comprising the steps of:
3 requesting the destination node to send a status message packet having a second
4 identification field and a second counter back to the source node;
5 programming the second counter to have the initial value;
6 adjusting the second counter by the preselected step in value at each node that
7 the message packet is forwarded to; and
8 accepting the message packet when the second counter reaches the preselected
9 trigger value;
10 whereby the status message packet is returned to the source node.

1 20. The method of Claim 19, further comprising the steps of:
2 sending a plurality of status query messages to a plurality of destination nodes,
3 the destination nodes having initial values corresponding to nodes that are each a
4 different number of node hops from the source node;
5 receiving status messages from responding destination nodes; and
6 determining the relative distance of responding nodes as a function of the initial
7 value of each responding node;
8 whereby a fault is isolated to a part of the network subsequent to the responding
9 active node the greatest number of node hops from the source node.

1 21. A method of detecting a fault in a linear chain of regenerator nodes using
2 a relative address protocol having an identifier for identifying a message packet as
3 having the relative address protocol, a relative source address for storing an initial value,
4 and a relative destination address field containing a counter, the method comprising the
5 steps of:

6 sending a first status query message packet requesting a status message from a
7 destination node at least one node hop from the source node; and

8 sending at least one subsequent status query message packet requesting a return
9 status message from another destination node corresponding to a different number of
10 node hops from the source node and recording whether the return status message is
11 received at the source node; and

12 determining the node the greatest number of node hops from the source node
13 replying to the status query message directed to it;

14 wherein a fault in a node is isolated to a portion of the chain network subsequent
15 to the node the greatest number of node hops from the source node returning the
16 corresponding status message.